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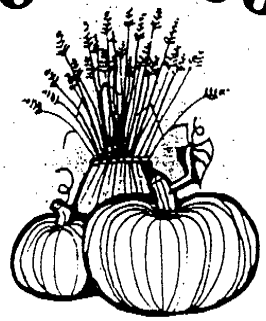
THE COMPLETE SPROUTING COOKBOOK



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For Malcolm

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NUTRITION

Grains, seeds and nuts have played a major role in the diet of man due to the high percentage of protein found in these foods. They contain from 7 to 40 percent protein. Since grains and seeds often are used as a source of protein in the diet, it is important to know how protein is related to maintaining a healthy body.

Protein comes from the Greek word *protos*, meaning "first". Nutritionists call protein "the building blocks" of good health. Every part of the body relies on protein for proper growth and repair. The body is largely made up of protein; your skin, muscles, internal organs, nails, hair, brain and even your bones contain protein. It is the basic element in protoplasm, which is the living, jelly-like substance of every cell. Food protein provides nitrogen and amino acids for the synthesis of body protein and other nitrogen-containing substances.

Thirty-two amino acids have been discovered, but only twenty-two of them are understood. If we get eight of these amino acids in our food we can manufacture the others required. These special eight amino acids cannot be synthesized and are thus called "essential." They must be provided in adequate amounts by dietary protein. The eight essential amino acids are isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. Excess protein serves only as a source of energy.

Most legumes, grains and nuts contain the essential amino acids. Some, however, are low in one or more essential amino acids. In order to make full use of any food protein the amino acids must be properly balanced. Such balanced proteins are called "complete." Proteins that

contain insufficient amounts of any of the essential amino acids are called "incomplete" or "limited". When two or more kinds of seeds containing "limited" protein are eaten at the same meal one may supply the amino acid lacking in the other; together they become a "complete" protein. For example, corn has a small amount of lysine and a large amount of methionine, while beans are rich in lysine and somewhat deficient in methionine. Corn tortillas and beans served together provide a balanced combination of essential amino acids.

Dr. W. R. Aykrod, a nutritional director, states that "in the raw state, many legumes contain substances which are indigestible or even antagonistic to digestion such as saponins, glycosides, alkaloids, conjugates of protein with phytin or hemicellulose, and substances which inhibit the action of the digestive enzyme, trypsin." Mature raw legumes or legumes not properly prepared for consumption may in fact be poisonous and contain a good deal of indigestible material. Adequate soaking, sprouting, prolonged cooking, mashing and a variety of fermentation procedures have been used since ancient times to remove toxins from legumes and enhance their digestibility. Germination is one of the best methods of preparation and allows the whole seed to be eaten in a palatable form. Legumes also lose their objectionable gas generating quality when sprouted.

It is generally agreed by nutritionists that foods high in water content are more easily broken down and assimilated by the body. Seeds are concentrated foods in the sense that they have low water content. Most seeds are about 12 percent water; when sprouted the water content may increase to as much as 95 percent.

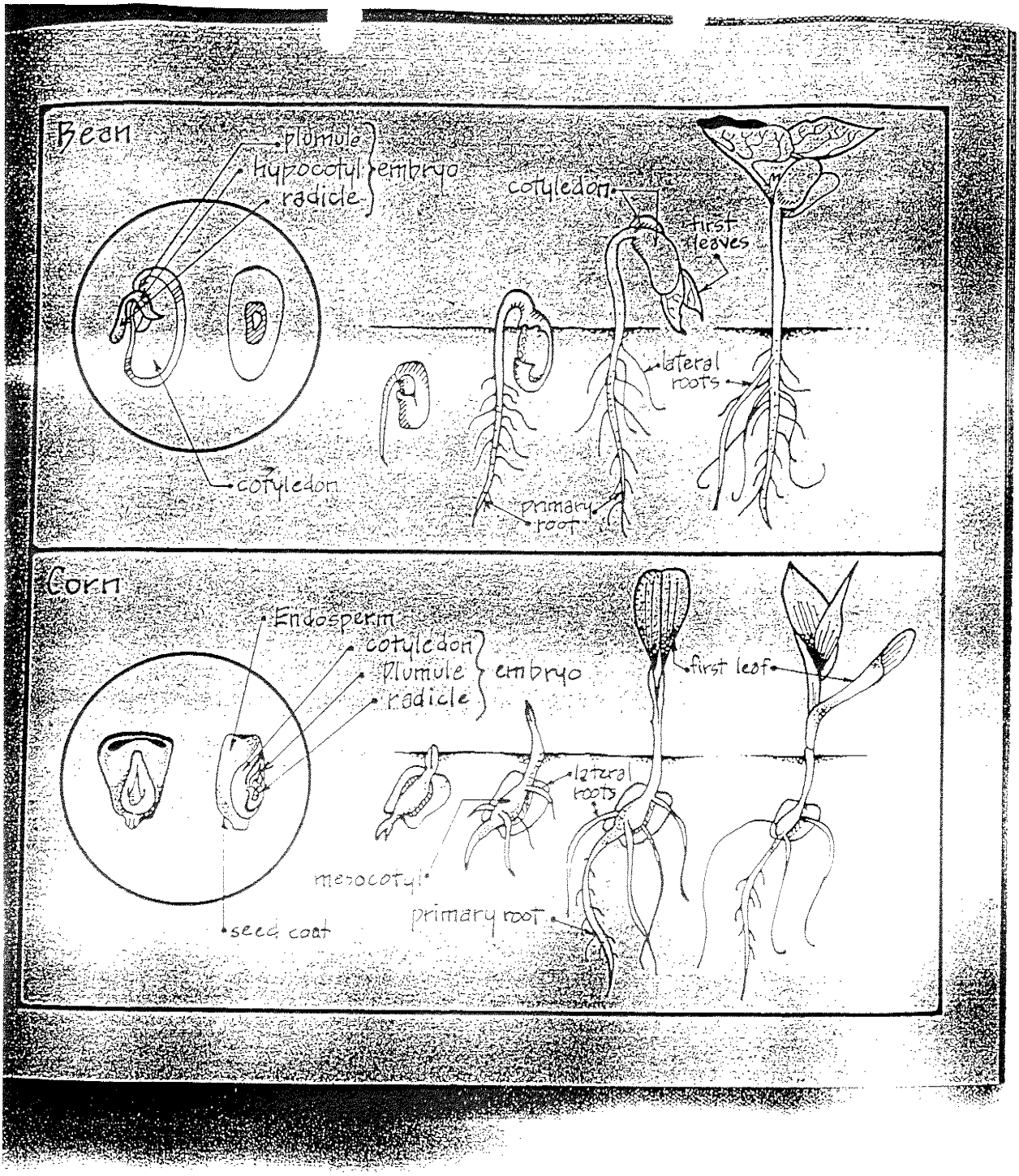
The process of sprouting seeds creates a more usable form of protein in many seeds. Sprouting also stimulates other beneficial changes. One

impressive change as the increasing of vitamin C which takes place during sprouting of seeds. The vitamin C in oats increases 600 percent after sprouting! The knowledge that sprouts could cure and prevent scurvy was available in 1782, long before ascorbic acid was discovered and labeled vitamin C in 1920.

Dr. Paul Burkholder of Yale University tested the nutritional contents of oat sprouts. He found that the sprouted oats contained 500 percent more nicotinic acid, biotin had increased 50 percent, pantothenic acid 200 percent, pyridoxine (B6) 500 percent, folic acid 600 percent, inositol 100 percent, thiamine (B1) 10 percent, and vitamin B2, 1350 percent.

Other studies of seeds and grains have yielded equally dramatic results. Dr. Chattepadhyay and his associates in Calcutta tested mung beans, lentils, peas, corn, rice and wheat for their vitamin E content. As a result of sprouting, the vitamin E content had increased up to 33 percent during a period of from two to four days. Vitamin A had increased in some seeds after sprouting for four days.

Even though complete research on the nutritional content of all sprouted seeds has not been made, there is more than enough scientific evidence available to conclude that sprouting a seed enhances its already high nutritional value.


Bean
plumule
hypocotyl
radicle
embryo
cotyledon
first leaves
lateral roots
cotyledon
primary root
Corn
Endosperm
cotyledon
plumule
radicle
embryo
first leaf
lateral roots
mesocotyl
primary root
seed coat

FROM SEEDS TO SPROUTS

A seed is a miniature plant in an arrested state of development. Its primary function is to propagate its species. Carbohydrates, proteins and fats are stored within the seed as a source of available nutrition when growth resumes. This storehouse of food is also nutritious for man. During the germination process, stored food is changed into a more usable form for both the plant and man.

The dry seed, when its activities are at a minimum, is in a dormant condition. Its food is held in reserve until the time and place are suitable for the start of new growth. Each species has its own built-in protection against heat, cold, drought and water. When the temperature, oxygen, light and moisture requirements are met, the seed will germinate. Sometimes a seed will wait several years for the right climatic combination before starting growth.

The outward appearance of seeds varies greatly in color, size, shape and form. Most plants can be identified by their seeds alone. The basic structure of all seeds is similar. Food reserve supplies are accumulated in the *endosperm,* (nourishment which surrounds the embryo) of corn and grains. These plants are called *monocots* (plants with single seed leaves). In *dicots* (plants with two seed leaves) such as beans and peas, the endosperm is absorbed by the *cotyledons* (seed leaves). The cotyledons serve as the food storage organ. The chief activity of the cotyledon and endosperm is the digestion and translocation of its reserve food to the embryo, which is the rudimentary growing part of the seed. Translocation is a process by which the sugars and amino acids move to the embryo for utilization in its growth and development.

The first step toward germination is the absorbing of water by the seed. This process is called imbibition. The seed coat is softened by the water, allowing the embryo and endosperm or cotyledon to "plump" itself with moisture. As the seed continues to swell, the seed coat is ruptured, freeing the embryo for continued development.

Dry seeds contain approximately 5 to 12 percent water. This proportion is increased up to 70 percent after a preliminary soaking of 12 hours. The amount of moisture around a seed affects the amount of oxygen available to it.

Respiration in dry seeds is extremely slow. Respiration is the metabolic process by which a plant or animal oxidizes its food materials. This process provides the living system with the energy it requires for the synthesis of new raw material and growth. After a definite amount of water is absorbed, a marked increase in seed respiration occurs. Even before we can see any growth, this increase of respiration is releasing energy for sprouting. As growth proceeds, the increasing demand for energy materials and new tissue is met by the digestion of reserve food. Starch is digested into sugar, lipids (oils) are changed to soluble compounds and storage proteins become amino acids.

The first visible evidence of germination is the breaking of the root tip through the seed covering. The growth of the primary root prior to the growth of the stem and leaves is nature's way of anchoring the seed and providing for further water absorption. Stem and leaf development follow. The seed becomes a little plant independent enough to absorb outside nourishment.

The temperature range for germinating seeds is generally between 32° and 113° F. A low percentage of germination may be expected at either extreme. For most crop plants, the optimum temperature lies between

68° and 86° F.; however, peas, lettuce, radishes, rye, barley and wheat will germinate readily at temperatures as low as 50° F.

Light does not influence the germination of most kinds of seeds, but germination of some is controlled by the presence or absence of light. Light also affects the flavor and the amount of chlorophyll contained in sprouts. Alfalfa, cress and other types of leafy sprouts should be "greened" in light for more chlorophyll and better flavor. Beans and sunflower seeds are more tasty if grown in the dark. In some seeds, exposure to light during the sprouting process inhibits the development of vitamin C.

Some sprouts should be harvested before the first leaves are fully developed. Sunflower seeds, for example, are tastiest when the root is only as long as the seed. Wheat and other grains are also best when the leaves are underdeveloped and the root is short. Alfalfa sprouts, however, should be between 2 and 2½ inches with 2 green leaves. Fenugreek may have roots as long as 3 inches. To prevent further growth, store sprouts in the refrigerator when they reach the desired length.

Vegetable Seeds

Cabbage, Chinese cabbage, cauliflower, collards, kale, broccoli, Brussels sprouts, kohlrabi, mustard, turnips, beets, chard, endive, lettuce and radish seeds are covered in this section.

Cabbage is one of the most ancient cultivated vegetables. Cabbage, Chinese cabbage, cauliflower, collards, kale, broccoli, Brussels sprouts, kohlrabi, mustard and turnips are all descendants of *Brassica oleraces*, a wild mustard-like weed found mostly along European sea-coasts. Today's "cabbage family" bears little resemblance to its wild ancestral parent. But like the 4000 year old parent plant, they grow best in temperate climates where the weather is cool and there is a plentiful supply of moisture. The seeds of the cabbage family are small, round, and easily sprouted.

Chinese cabbage (*pets ahi*) is one of the latest additions to the cabbage family in the Western world. It is also called celery cabbage. The Chinese variety has crisp leaves and a mild cabbage flavor.

Cauliflower has been a favorite vegetable in Italy for centuries. Its name means "cabbage flower." It is native to Asia and Europe and has been cultivated since 600 B.C. Cauliflower has been much improved over the centuries and the flower has increased in size by careful cultivation.

Collards and kale are similar, except for the shape of their leaves. They were developed in the Mediterranean and Asia Minor. The Greeks and the Romans both cultivated collards and kale. England adopted them from the Romans and for thousands of years grew them as a major winter vegetable. Kale is also known as borecole. Borecole

probably came from the Dutch word *boerenkool* which means "peasant cabbage." Because it is often grown in the winter, kale has been called winter greens.

Broccoli has been grown by the Greeks and the Romans for 2000 years, although it was not known in the United States until the 1920's. Broccoli was introduced as a "new" vegetable and took only 10 years to become an American favorite. Today more than 100 million pounds are produced in the United States.

Brussels sprouts are named for the capital of Belgium, where they have been cultivated for hundreds of years. Climate is a critical factor in growing Brussels sprouts. It will not develop miniature cabbage heads if the temperature rises above 55 degrees. About 85 percent of the Brussels sprouts grown in the United States are cultivated in San Mateo, Santa Cruz and Monterey counties of California where a coastal fog insures cool temperatures.

Kohlrabi has a German name. *Kohl* means cabbage and *rabi* means turnip. It is one of the few vegetables to originate in Northern Europe. Its flavor resembles a turnip, but is milder. The globe of this unusual-looking plant is usually eaten and the leaves discarded.

Mustard originated in the Middle East where it has been under cultivation for over two millennia. It is often mentioned in Biblical, Greek and Roman writings. Hippocrates wrote of its medicinal qualities. Mustard was prepared in the form of a condiment by Mrs. Clements of Durham County England. It is said that she made a small fortune by selling powdered mustard. Today powdered mustard is still known as Durham mustard in England.

Turnips were once believed to be native to Russia and Scandinavia, but they were cultivated in India long before being introduced into Europe. The Romans cultivated many kinds of turnips; round, long

and flat. Today's varieties may weigh as little as a few ounces to as much as 25 pounds. In the 17th century, turnips were used in England as a forage crop. The British planted turnips for crop rotation, thus providing a supply of winter food for cattle and sheep. Turnips have been highly regarded for centuries as a staple winter vegetable where no other produce was available. They were not cultivated in the United States until the early 1600's.

Beets, chard and sugar beets are from the Beta family. All three were developed from a wild species that was common in Southern Europe. The wild plant grew in sandy soil along the sea. Chard is similar to an ancient variety grown in prehistoric times. It is disease free and seldom bothered by insects. For this reason beets and chard are favorites of home gardeners.

Endive originated as an herb growing wild in Southern Europe and the Near East. The ancient Egyptians and Greeks used endive as a vegetable. It is an excellent salad plant similar to lettuce with a somewhat bitter flavor.

Modern lettuce was probably derived from the prickly wild species of the family Compositae, native to Asia Minor and adjacent areas. It gets it name, *Lactuca sative,* from an Old French word *Laitues* (milky) because of its milky root. Lettuce was served to the kings of Persia over 2500 years ago. Columbus is credited with bringing lettuce to the New World. It is now one of the most universally popular salad plants.

Radishes are also an ancient vegetable. They are believed to be native to China, where they were cultivated in the 7th century B.C. The early Egyptians also enjoyed their flavor. The ancient Greeks enjoyed pelting unpopular politicians with radishes. Radishes come in

a large variety of sizes and colors, from shades of white, pink and red to purple and black. The American or European variety may weigh as little as a few grams, while the *dikon* from Japan often weighs as much as two pounds. Radishes are swift to mature: some are ready to harvest just ten days after planting.

Vegetable seed sprouts are abundant in vitamins and minerals. They are low in calories and easily digested. Vegetable sprouts are a good source of phosphorus, iron and potassium, and are rich in riboflavin, niacin, vitamin C and vitamin A. To make the best use of these succulent little plants, eat them raw in salads or add them to soups just before serving.

Sprouting method	jar
Temperature	68° to 86°
Rinse	twice a day
Harvest length	1 to 2 inches greened
Sprouting time	3 to 5 days
Yield	varies with the seed 1 T makes from 1 to 2 cups